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TABLE OF CONTENTS.

Proceedings of the Society:—Cantor Lectures: Lecture II.—On the Discoveries in Chemistry applied to Arts and Manufactures 711
Proceedings of Institutions:—Kent Association of Institutes 720
Conservatoire Imperial de Musique et de Declamation of Paris 721
Commerce:—The Sugar Trade 723
Colonies:—Wheat in South Australia—Education in South Australia 725
Notes:—Paris Exhibition of 1867—Exhibition of Fishing Appliances—Asylum for the Middle Classes—Names of Streets in Paris—International Postal Arrangements 726
Patents 726

Proceedings of the Society.

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CANTOR LECTURES.

"On some of the most important Chemical Discoveries made within the last Two Years." By Dr. F. Crace Calvert, F.R.S., F.C.S.

Lecture II.

Delivered on Tuesday, the 11th of April, 1865.

On the Discoveries in Chemistry applied to Arts and Manufactures.—(*Continued.*)

One of the most curious and important applications which have lately been made of chemistry to manufactures is that of coal gas as a means of obtaining intense heats. In fact, heats have been secured which far exceed those previously obtained by the combustion of coals and other carbonaceous matters.

To understand how this result has been effected, it is necessary that I should say a few words on the combustion of coal gas. When coal gas is ignited, the oxygen of the atmosphere first combines with the hydrogen of the hydro-carbons, either gaseous or sufficiently volatile to assume a gaseous form, so as to produce water. Whilst a part of the carbon of these hydro-carbons combines with the oxygen to produce carbonic acid, the other portions of carbon float in the mass of ignited gaseous matters, and reach a sufficient temperature to radiate light in all directions. It follows, therefore, that the richer the coal gas is in hydro-carbons, into the composition of which enters a large proportion of carbon, the more brilliant will be the flame.

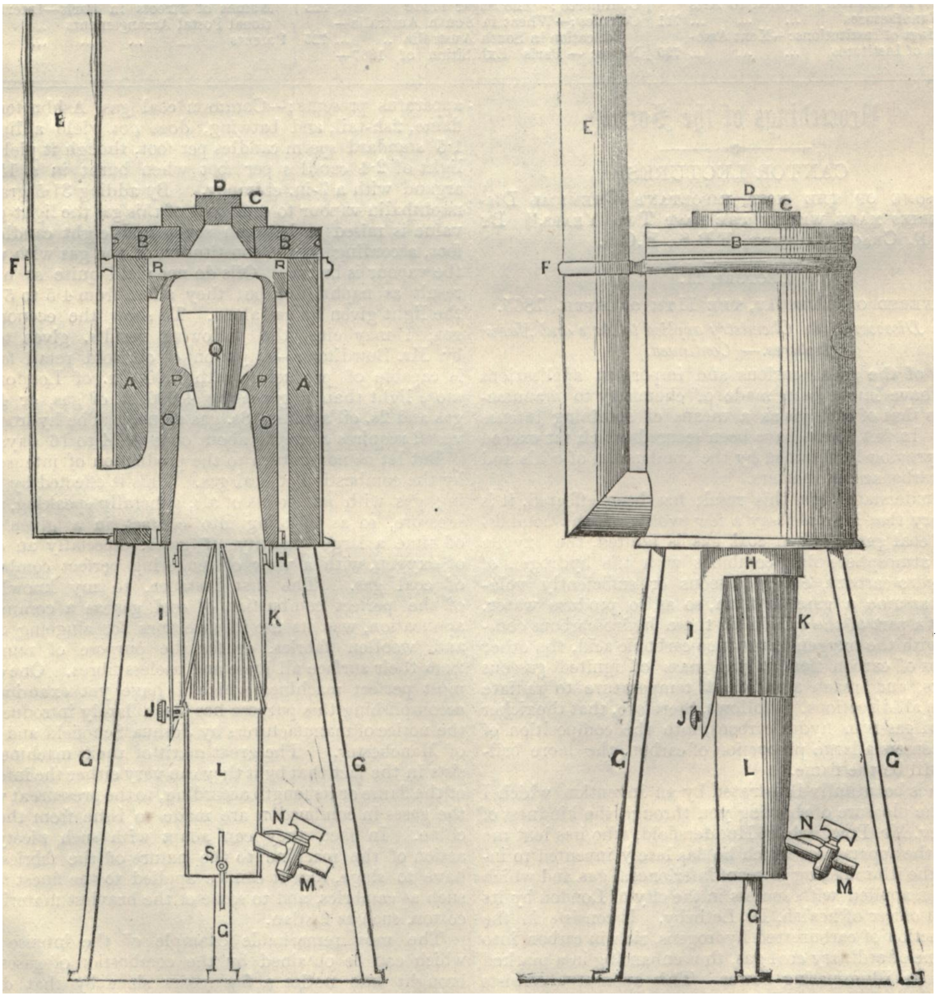
This is beautifully illustrated by an invention which I have the pleasure of showing you through the kindness of the Rev. Mr. Bowditch, of Huddersfield, who has lent me one of the apparatuses which he has lately invented to increase the illuminating power of inferior coal gas, and which has been applied with success in the city of London by its learned officer of health, Dr. Letheby. It consists in the introduction of carburetted hydrogens, rich in carbon, into the flame of ordinary coal gas, thus enhancing in a marked degree its illuminating power. This apparatus consists of:—A gas-tight metallic vessel, which holds the hydrocarbons, and which has an inlet connected with a gas supply and an outlet connected with the burner. The gas in its course passes over the surface of the hydro-carbons. Being above the flame, the vessel and its contents become heated, and part of the latter is converted into vapour, which the passing gas carries with it to the burners to enrich the flame.

The following are the advantages which Mr. Bowditch's apparatus presents:—Common coal gas, Ashburton flat flame, fish-tail, and batwing, does not yield a light of 1·5 standard sperm candles per foot, though it yields the light of 2·4 candles per foot when burnt in a 15-hole argand with a 7-in. chimney. By adding 31·5 grains of naphthalin vapour to each foot of this gas the light-giving value is raised to between seven and eight candles per foot, according to the constitution of the gas with which the vapour is burnt. Oils do not yield quite so high a result as naphthalin, but they afford from 4·5 to 5 times the light given by gas alone. To show the economy of gas, I may cite the following results, given to me by Mr. Bowditch:—A gallon of oil, sold retail for 2s., is capable of producing, with 1,000 ft. of London gas, more light than is given by 4,000 ft. of gas, or 4s. 6d. gas and 2s. oil against 18s. gas alone. The hydrocarbon vessel requires charging about once in 14 to 16 days.

But let us now return to the production of intense heat by the combustion of coal gas. This is effected by burning gas with an excess of air, generally speaking, under pressure, so as to bring into contact in a given space of time a large quantity of gases, especially an excess of oxygen, with a view of rendering perfect combustion of coal gas. The first instance, to my knowledge, of the perfect combustion of coal gas as a commercial application, was its use in machines for singeing cotton and woollen fabrics, or for the purpose of removing from their surface all loose and useless fibres. One of the most perfect machines which I have yet examined for accomplishing this purpose has been lately introduced to the notice of manufacturers by Joshua Schofield and Sons, of Manchester. The great merit of their machine consists in the fact that by it they can vary either the intensity of the flame or its length according, to the pressure at which the gases in combustion are made to issue from the machine. In fact, they can adapt with such nicety the action of the machine to the nature of the fabrics they have to singe, that it can be applied to the finest fabric, such as cambrics, and to some of the heaviest materials in cotton, such as fustian.

The most remarkable example of the intense heat which can be obtained by the combustion of gases was brought into notice a few years since by that distinguished chemist M. H. St. Clair-Deville (the discoverer of aluminium), by which he succeeded not only in melting several metals which, until his experiments, had resisted all other modes of effecting their fusion, but in melting in his laboratory as much as 25lbs. of platinum, one of the most refractory metals known, and running it into one solid ingot. In 1862, the well-known metallurgists, Messrs. Johnson and Matthey, invited to their works a large circle of the most scientific men of Europe, who were attending the Exhibition as jurors, to witness the fusion of 220lbs. of platinum, and the running of it into one single solid ingot. This wonderful exploit in the production of heat was effected in a furnace similar in principle to that which had been devised by M. St. Clair-Deville, viz., in a furnace, the inner part of which was lined with blocks of quick lime, the only material found by M. Deville to be susceptible of resisting the intense heat which was produced by bringing at the upper part of the furnace a large jet of gas and air intimately mixed, and working under pressure. The flame, in passing from the upper part of the furnace and making its exit at the lower part, produced so great a heat as to melt the above stated quantity of platinum.

The observations of M. Deville soon brought into existence some extremely simple and handy furnaces to effect fusions and assays on a laboratory scale. Some of the best furnaces contrived for that purpose are due to Mr. J. J. Griffin, of Bunhill-row. The principal feature of his furnace is using as a generator for heat a large Bunsen burner, which consists of a hollow tube, at the bottom of which there is an inlet for coal gas, and at a certain height in the tube a number of openings through which the air rushes in to mingle with the gas; both air and gas issue at the top of the tube, and when ignited produce an intense heat. The flame so produced is made to play round a crucible containing the materials to be assayed, and which itself is surrounded by thick earthenware tiles, preventing the heat passing through the furnace from radiating itself in all directions, thus concentrating its action entirely on the little crucible placed in the centre. But the most perfect contrivance of the sort which has yet been brought to the notice of the public is one due to Mr. G. Gore, F.R.S. The following is the description of Mr. Gore's gas furnace:



—A is a cylinder of fire-clay, about 9 inches high and 6 inches diameter, open at both ends, and with a hole at the back part near the bottom, to lead into the chimney; it is covered by a moveable plate of fire-clay, B, with a hole in its centre for the introduction of the crucible or of substances to be melted; this hole is closed by a perforated plug of fire-clay, C, for access to the contents of the crucible; and that again is closed by another stopper of fire-clay, D. E is a chimney of sheet iron, about five or six feet high, kept upright by a ring of iron, F, attached to the top of the furnace. The fire-clay cylinder is enclosed in a sheet iron casing with a bottom of iron, to which are fixed three iron legs, G. An iron tube, H, with a prolongation, I, supports by means of the screw, J, the burner, K, and its tube, L, which is open at both ends. Gas is supplied to the burner by means of the tap, M, which has a small index, N, attached to it for assistance in adjusting the gas. Inside the largest cylinder is another fire-clay cylinder or cupola, O, with open ends, and with three projections of fire-clay, P, for supporting the crucible Q; it is kept steady by means of three clay wedges; R S is an air-valve for closing the bottom of the tube L. The gas burner is a thin metal cylinder, deeply corrugated at its upper end, with the corrugations diminishing to nothing at its lower end, as shown in the engravings. The action of this furnace is as follows:—Gas is admitted to the open tube L by the tap M; it there mixes with air to form a nearly combustible mixture, which ascends through the burner, and burns in the clay cylinder O, being supplied with the remainder of air necessary to combustion through the tube H to the outer surface of the flame by means of the spaces between the corrugations. The flame and products of combustion pass up through cylinder O, and then downwards outside of it to the chimney, the point of greatest heat being at Q.

Mr. Gore states that one of his smallest furnaces, consuming 33 feet of coal gas per hour is capable of melting 8 oz. of copper and 6oz. of cast iron; that the next sized furnace, consuming about twice the quantity of gas, will melt 40oz. of copper.

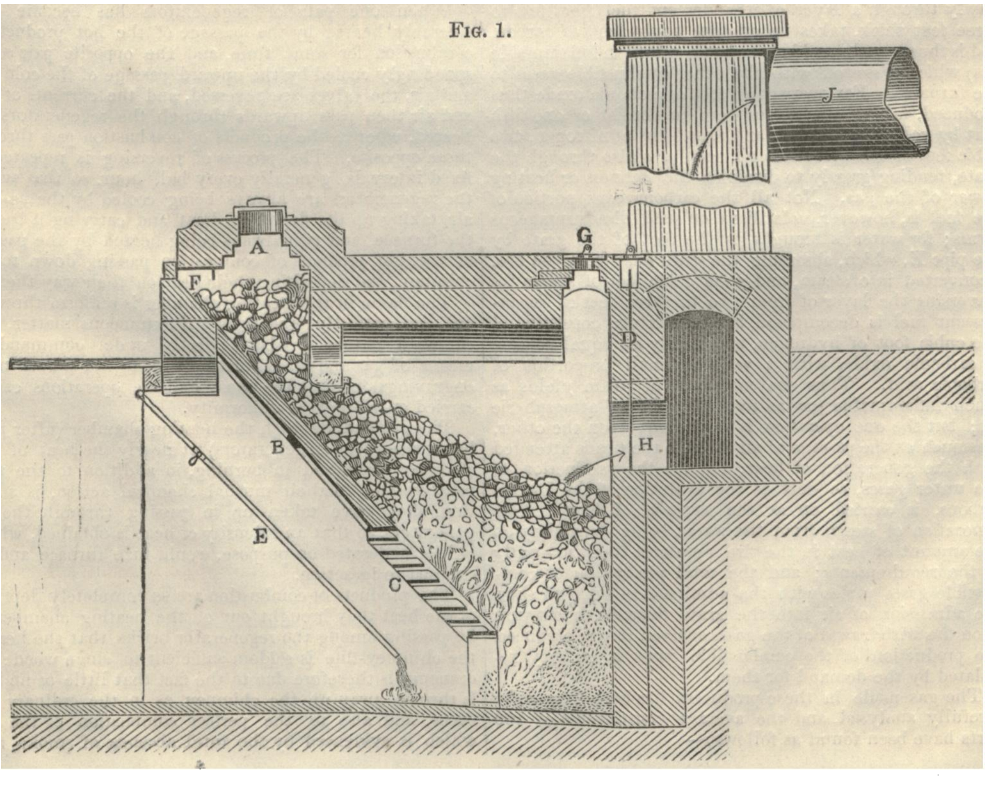
But the most important improvement which has been effected of late years in the production of intense heat by the combustion of the gases generated through the distillation of inferior coals, is that of Mr. C. W. Siemens, F.R.S., of Great George-street. The benefits which are conferred on manufacturers and the public by the furnaces devised by Mr. Siemens cannot be overrated. They are not only economical in their use, but as they enable the manufacturer to use an inferior class of fuel to generate the heat required, they must undeniably be of great advantage; and to the public in general they will be a great boon, as they do away with the nuisance attached to all manufacturing districts, in the dark black smoke escaping from chimneys, polluting the atmosphere and rendering it so disagreeable to those who are compelled by their occupations to live within reach of its influence.

I may state, *en passant*, that the large amount of black smoke which floats in the atmosphere of Manchester, Sheffield, Birmingham, and other towns, is not only injurious by depriving those places of much light so beneficial to life and health, but is also a nuisance from the immense amount of soot and dirt with which it is accompanied. There cannot be a doubt that, owing to the imperfect combustion which the products undergo in many of the furnaces belonging to manufacturers, and which is shown by the appearance of the smoke itself, the air is rendered more unwholesome than it would be if the products that escape had undergone perfect combustion, because volatile matters escape which are known to have a most destructive action on health and vegetation. The improved state of the public squares in London—and especially of those which are on the banks of the Thames—can be witnessed by all who have observed their condition since the consumption of smoke has been made compulsory in London and its suburbs.

Mr. Siemens's furnaces, I am happy to say, are not in a state of mere experiment, but they have received the sanction of a great number of manufacturers, and especially of those who little expected that the necessary heat for their operations could be obtained without interfering with their manufacture, in the carrying out of which they thought the production of smoke could not be prevented. Thus we find M. Siemens's furnaces employed with great success and economy in glass works, in potteries, and in iron forges, works which used to be a nuisance to their neighbours, by the large volumes of black smoke which they were constantly emitting from their chimneys.

Before describing Mr. Siemens's furnace, it is necessary

Fig. 1.



that I should state that, in the ordinary furnaces, only about 25 per cent. of the heating power of the fuel is rendered available in carrying out the manufacturing operations. This is due to imperfect combustion, and to the fact that only the heat of combustion exceeding that of the body treated is utilized; the remainder of the heat, in many instances, by far the greater proportion of the whole, being allowed to escape uselessly up the chimney.

I shall now give a description of one of M. Siemen's furnaces. The gas producer and furnace are quite distinct, and may be placed at any convenient distance from each other. The gas producer is shown in Fig. 1 (see page 713). The fuel is supplied at intervals of about two hours through the covered openings A, and descends gradually on the inclined plane B, which is set at an inclination to suit the kind of fuel used. The upper portion of the incline B is made solid, being formed of iron plates covered with firebrick, but the lower portion C is an open grate formed of horizontal flat steps. The opening under the lower step is made larger than the others, to enable clinkers to be withdrawn. The small stoppered holes F F at the front and G G at the top of the producer are provided to allow of putting in an iron bar occasionally to break up the mass of fuel and detach clinkers from the side walls. Each producer is capable of converting daily about two tons of fuel into a combustible gas, which passes off through the opening H into the main gas flue leading to the furnaces.

The action of the gas producer in working is as follows:—The fuel descending slowly on the incline plane B, becomes heated and parts with its volatile constituents, the hydro-carbon gases, water, ammonia, and a small proportion of carbonic acid, which are the same as would be evolved from it in a gas retort. There now remains from 60 to 70 per cent. of purely carbonaceous matter to be disposed of, which is accomplished by the current of air slowly entering through the grate C, producing regular combustion immediately upon the grate; but the carbonic acid (an incombustible gas) thus produced having to pass slowly through a layer of incandescent fuel from two to three feet thick, takes up another equivalent of carbon, and is thus transformed into carbonic oxide (an inflammable gas) which passes off with the other combustible gases to the furnaces. For every cubic foot of carbonic oxide thus produced, taking the atmosphere to consist of one-fifth part by volume of oxygen and four-fifths of nitrogen, two cubic feet of incombustible nitrogen pass also through the grate, tending greatly to diminish the richness or heating power of the gas. Not all the carbonaceous portion of the fuel is, however, volatilised on such disadvantageous terms; for water is brought to the foot of the grate by the pipe E, which, absorbing the spare heat from the fire, is converted into steam, and each cubic foot of steam in traversing the layer of from two to three feet of incandescent fuel is decomposed into a mixture consisting of one cubic foot of hydrogen, and nearly an equal volume of carbonic oxide, with a variable small proportion of carbonic acid. Thus one cubic foot of steam yields as much inflammable gas as five cubic feet of atmospheric air; but the one operation is dependent upon the other, inasmuch as the passage of air through the fire is attended with the generation of heat, whereas the production of the water gases, as well as the evolution of the hydrocarbons, is carried on at the expense of heat. The generation of steam from the water, being dependent on the amount of heat in the fire, regulates itself naturally to the requirements; and the total production of combustible gases varies with the admission of air, and since the admission of air into the grate depends in its turn upon the withdrawal of the gases evolved in the producer, the production of the combustible gases is entirely regulated by the demand for them.

The gas made in these producers has been frequently carefully analysed, and the average constituents of 100 parts have been found as follows:—

Carbonic acid	4·1
Oxygen	0·4
Carbonic oxide	23·7
Carburetted hydrogen	2·2
Hydrogen	8·0
Nitrogen	61·5
	99·9

The furnaces are applicable for all purposes where intense heat is required, such as for glass houses, puddling, heating iron and steel, iron melting for foundry purposes, steel melting, muffles and copper smelting. In all applications the furnaces are of the same construction in principle, the arrangements only varying with the different operations to be carried on in the heating chamber. The heating furnace has been selected for illustration in Fig. 2, page 715.

Underneath the heating chamber K, are placed transversly the four regenerators L L L L, which are chambers filled with fire bricks built up with spaces between them. The regenerators work in pairs, the two under the right-hand end of the furnace communicating with that end of the heating chamber, while the other two communicate with the opposite end.

The gas passes from the main gas flue through the reversing valve S into the flues R R, at the bottom of one of the regenerators L, up through which it passes to the port M. Air is also admitted through a reversing valve at the back of S (not shown in the figure), thence into the flues O O, up through the second regenerator L, to the port N, where it meets with the gas, mingles with it, and produces an intense and uniform flame, which distributes itself all over the heating chamber K.

The products of combustion together with the excess or waste heat of the furnace, instead of being passed, as in ordinary furnaces, up the stack, and either entirely thrown away or only partially utilized, are carried down into the other pair of regenerators, where they are deprived of their heat, and thence proceed through the reversing valves to the chimney by the flue T.

When one pair of regenerators has become considerably heated by the passage of the hot products of combustion for some time, and the opposite pair correspondingly cooled by the upward passage of the cold gas and air, the valves are reversed, and the currents of gas and air then pass upwards through the regenerators last heated, whereas the products of combustion pass through those opposite. The process of reversing is repeated at fixed intervals, generally every half hour, so that two of the regenerators are always being cooled by the gas and air taking up the deposited heat and carrying it back to the furnace, and two always being heated by the passage of the hot products of combustion passing down to the chimney, and depositing their heat on their way there.

The flame in the heating chamber is uniform throughout, and perfectly free from all extraneous matter. Its chemical nature is also perfectly under command by means of gas and air regulating valves (not shown in the engravings), so that the most delicate operations can be carried on with great uniformity.

The gas and air reach the heating chamber (after passing through the regenerators) at nearly the heat of that chamber itself, and in burning, in addition to the temperature due to their mutual chemical action, is added that they have taken up in passing through the regenerators, so that an intensity of heat is obtained, which, unless moderated on purpose, would fuze furnace and all exposed to its action.

The products of combustion are so completely deprived of the heat they brought out of the heating chamber K, by passing among the regenerator bricks, that the heat in the chimney-flue is seldom sufficient to singe wood; the economy is therefore due to the fact that little or no heat is thrown away up the chimney, as in the ordinary furnaces, and also to the perfect combustion of the fuel which is evidenced by the total absence of smoke from the stack; whereas in the common furnaces the combustion is so imperfect, that clouds of powdered carbon, in the form of smoke, envelope all manufacturing towns, and gases are allowed to escape with two-thirds of their heating power undeveloped.

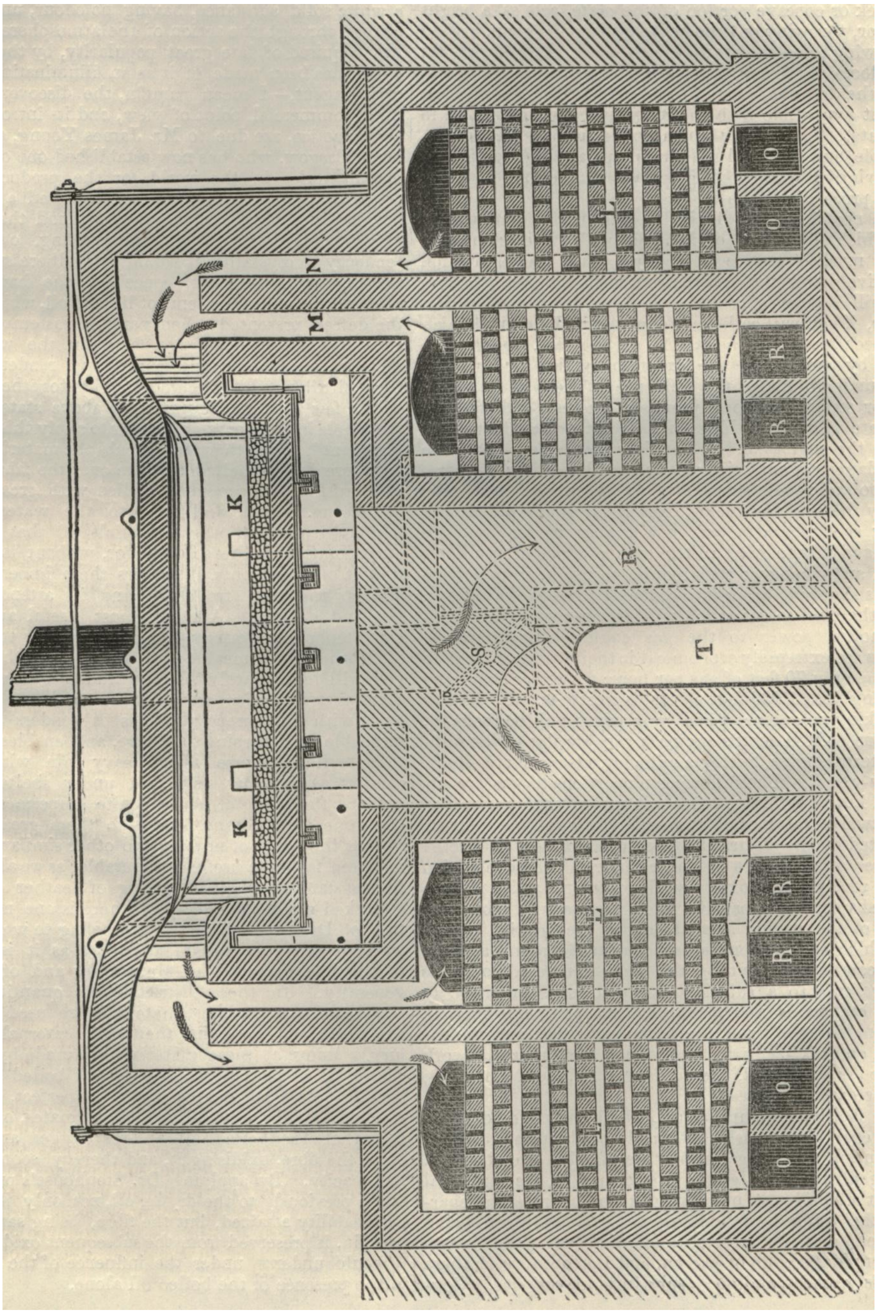
The saving of fuel in these furnaces, as compared to the ordinary kind, ranges between 40 and 60 per cent. in weight, according to the fuel used. In many instances an additional saving can be made in the cost of the fuel by using inferior qualities, such as coal and coke dust, lignite, and peat.

The intensity of the heat, purity of the flame, and the absence of cutting draughts in the heating chamber, is of great advantage for all metallurgical operations, tending greatly to improve the quality of the produce, and occasioning a saving of about 5 per cent. in the waste of the metal treated in puddling and iron re-heating furnaces, &c.

The peculiarities and advantages of these furnaces are, that gas fuel alone is employed, that perfect and entire combustion is obtained, and that the heat, which is usually allowed to escape up the chimney, is here stored up to be afterwards brought back to the furnaces.

Whilst on the question of the combustion of coals,

FIG. 2.



and of smoke, allow me to draw your attention to a clever invention by Mr. Snook, of Manchester, which he calls an "Invigorator." The invention may briefly be described as an apparatus placed within the semicircle forming the upper portion of an ordinary register fire-grate, formed entirely of cast-iron, and so constructed as to be readily applied to all existing grates known as of the register form. In experiments which have been made, it has been proved that after lighting the fire (the whole of the apparatus being closed so as to act as a blower), a brisk bright fire is produced in about four minutes. A large concave elliptical plate immediately over the grate bars, suspended on end pivots, is tilted over to an angle of about 70 degrees, when it is seen that the back or concave portion of the plate, acts as a bright reflector, throwing out the heat rays into the room, instead of allowing them to pass up the chimney. Two horizontal plate doors, or louvres, above the reflector, are next opened, when the draught is found to be reduced to the smallest amount compatible with the continuance of combustion in the grate. The heat thrown out from the fire is considerable, and the fire itself forms a pleasant object to look at, having a warm red glow, without either flame or smoke proceeding from it.

The next invention I wish to call your attention to is one, which, like that of Mr. Siemen's, is calculated to render marked service to society. It is the production of motive power through the combustion of coal gas, and you will I hope appreciate the discovery due to Mr. Lenoir, if you will call back to memory the efforts which have been made for the last 20 or 30 years, to generate power by employing the expansion which air or other gases undergo under the influence of heat as a substitute for steam—the long promised success and the unfortunate failures of Ericsson. What especially recommends the engines of M. Lenoir is their safety, for there is no danger of explosion; their cleanliness, for they require no fuel; their simplicity, which enables those who employ them to use them in any room at any height and at any spot where motive power may be required, for they have only to erect a little engine of one or two horse power, and whenever they require to use it, all they have to do is simply to bring into contact two poles of a battery, when the fluid so generated will traverse space, and convey motive power to the gas engine. Lastly, these engines are extremely economical in their working, for they consume only 70 feet of gas per horse power per hour; and assuming that 1,000 feet of gas is worth 4s. 6d., the cost of working an engine of one-horse power will be about 4d. per hour. M. Lenoir's engine is very similar to the ordinary steam-engine, having a cylinder, piston, crank-shaft, and fly-wheel. The following proportions of gas are admitted in the cylinder:—One volume of coal gas mixed with twelve volumes of atmospheric air. This mixture is ignited by the electrical spark from a battery connected by wires at each end of the cylinder. The connection being made and broken by the rotatory action of the crank-shank, the expansive force necessary to move the piston of the engine is produced by the ignition of the gas, which not only produces steam and carbonic acid by their combustion, but by the heat generated increases their volume to a sufficient extent to force the piston to travel backwards and forwards, thus producing motion. The engine once fixed, the battery charged, and the gas turned on, it is ready for action, and as soon as the work required is completed, the gas is shut off, the engine stops, and the expense ceases.

The facility for employing Lenoir's engine in countries where coal is not easily attainable has been increased by substituting for coal gas a mixture of oxide of carbon and hydrogen, which can easily be procured on a commercial scale at a small cost by passing steam over heated charcoal, the water being decomposed, its hydrogen being liberated, and its oxygen combining with the carbon itself produces oxide of carbon, and the mixture of these gases is a cheap and good substitute for coal gas. Consequently M. Lenoir's engines can be employed with great advantage in our British colonies and in South America.

I shall now have the pleasure of calling your attention to an interesting and valuable invention of one of the most learned and eminent chemists of England, Dr. J. Stenhouse, F.R.S., who has devised quite a new method of waterproofing vegetable and animal tissues and fabrics. Previously to his discovery, the modes of waterproofing consisted in using bees' wax and various kinds of drying oils, such as linseed, the siccation of which is enhanced by boiling them with peroxides of lead or manganese. Further, you are all aware of the extensive use which has been made of caoutchouc and gutta percha for waterproofing purposes. Dr. Stenhouse's waterproofing material is a white solid substance, having no odour, undergoing no change through the action of the atmosphere, and which has acquired of late great popularity, by the application which has been made of it as an illuminating and lubricating agent,—I mean paraffin, the discovery of which, in a commercial point of view, and its introduction into public notice, are due to Mr. James Young, of Bathgate, near Glasgow, who has now established one of the largest manufactories in the world for the production of this article, notwithstanding it was considered a commercial novelty in 1852. Dr. Stenhouse found that if he employed pure paraffin for waterproofing, owing to its tendency to crystallise it would not adhere sufficiently to fabrics. He, therefore, conceived the happy idea of adding to it a few per cent. of linseed oil, which overcame the defects presented when paraffin was employed alone, effecting a better adhesion between the waterproofing material and the textile fabrics, and rendering leathers more flexible. Dr. Stenhouse melts together paraffin oil with a few per cent. of linseed as above stated. He runs the whole into cakes, and in order to apply this waterproofing agent he beats the cake and rubs the materials over with it or spreads the melted mixture over the fabric by means of a brush. His process is applied with great advantage by Messrs. Silver and Co., to the waterproofing of soldiers' tents, and other materials of that class, to the great comfort of the soldiers, for, without increasing the weight of their tents, it renders them impermeable, and protects the men from rain and its attendant discomfort and danger. Another most useful application of Dr. Stenhouse's waterproofing material is the rendering of leather impermeable; by examining the specimens you will immediately see the immense advantage that cavalry will derive from having their saddles rubbed over with this preparation, as it renders the leather incapable of absorbing moisture, and enables the soldier to mount his horse after heavy rain with as much comfort as if it had remained under shelter. It also renders the soles of shoes quite impermeable, and at the same time communicates to them great flexibility, so that the boots of navvies and other similar articles are rendered far more useful and durable, as we all know that the constant wetting and drying of leather expedites in a marked manner its decay. There is one more application of Dr. Stenhouse's waterproofing to which I should wish to call your special attention, as it is of interest to the manufacturers of Manchester and of Lancashire generally. In those districts large quantities of what is called waterproofing materials are used in packing the goods, and preserving them from external wet or injury. Many of these materials are made by covering a coarse calico fabric with a coating of boiled linseed oil, but this class of packing is very imperfect, and loses its strength rapidly, especially in hot climates, owing to the fact that the boiled oil absorbs oxygen and carries it on to the fibre, oxidising it, and thereby soon destroying its tenacity. By applying Dr. Stenhouse's process to the fabric previously to the drying oil, not only is great impermeability attained, but the fibre, being saturated with paraffin, is preserved from the subsequent oxidation which it would undergo under the influence of the atmosphere in the presence of the boiled oil alone.

I should have wished to have dwelt at some length on the interesting application which has been made of late years, especially on the Continent, of another coal product, which, like most of those whose origin is due to coal, has received many valuable and beautiful applications. The one I now refer to is called bisulphide of carbon, and is applied with great success not only to the extraction of fatty matters from various seeds and fruits, such as olive, linseed, &c., but in Algiers for extracting from flowers various essential oils, commonly called perfumes, such as essence of roses, lavender, jasmine, &c. You will, no doubt, remember also the useful application which bisulphide of carbon receives in the hands of Messrs. Allbright and Co., of Birmingham, in separating the common phosphorus from the red or amorphous phosphorus now applied to the manufacture of chemical matches, as explained to you in my first lecture of last year's course.

I cannot conclude what I have to say respecting coal products, without stating the fact that, since I had the honour of delivering a lecture in this room, in 1862, many beautiful and valuable discoveries have been made in connection with coal-tar colours. Dr. A. W. Hoffman has succeeded in obtaining some magnificent purples, by a process as curious as it is highly scientific, and such as might be expected from so talented a chemist. Since then a splendid green colour, called verdine, and which has the curious property of retaining that colour in artificial light, yea more than that—of increasing in beauty in the presence of that light—has been discovered by M. Eusebe. A beautiful fast black, easily applicable to the art of calico-printing, has also been devised; and lastly, in the hands of Messrs. Simpson, Maule, and Nicholson, the well-known colour called magenta, and a beautiful blue called opal, have not only been much increased in beauty, but their cost of production has been materially reduced. In fact, at the present day, every shade of colour is produced from coal tar products; but the subject is too vast for me to attempt now to enter into details as to their mode of production and application.

As the hour is advancing, I must, though with regret, leave the interesting subjects which have reference to coal and its products, and pass to another class of manufacture. The first of these has reference to the refining of sugar, and among the several improvements which have been effected in this branch of manufacture during the last few years none is more important in its general bearing than that recently brought to the notice of tne public by Mr. Alfred Fryer, of the well-known firm of Fryer, Benson, and Foster, of Manchester. This gentleman has published some valuable information on the composition of the sugar-cane juice, and the alterations it undergoes under the influence of heat and atmospheric air, and has conferred on the colonies a great boon by inventing an apparatus which will effect a great saving in obtaining sugars. Mr. Fryer's experiments on the cane juice teach us that, instead of only extracting 49 per cent. of the juice, as is usually the case, when the canes are worked by the old system, 61 per cent. can be obtained with a good steam engine having 24 inch rollers; and by pressing the megass a second time through the rollers as much as 70 per cent. can be obtained; and Mr. Fryer does not doubt that even 80 per cent. may be reached, if more attention is paid to the pressing of the canes through the rollers. Mr. Fryer has also published some interesting facts on the action of the oxygen of the atmosphere on cane juice. Thus he has observed that the juice rapidly darkens, and that this increase of colouration is not only an indication that the juice is undergoing deterioration, but that no amount of defecation will subsequently remove this colouration. He has further noticed that cane-juice rapidly becomes acid, and the acidity increases also in a very rapid manner. He gives an instance—a pattern of too many others—where the juice, after expression flowed down a spout 250 feet in length, from the mill to the boiling-house, occupying in its descent about half-a-minute. The amount of acidity increased from 100 to 253, and the colour deepened fourfold.

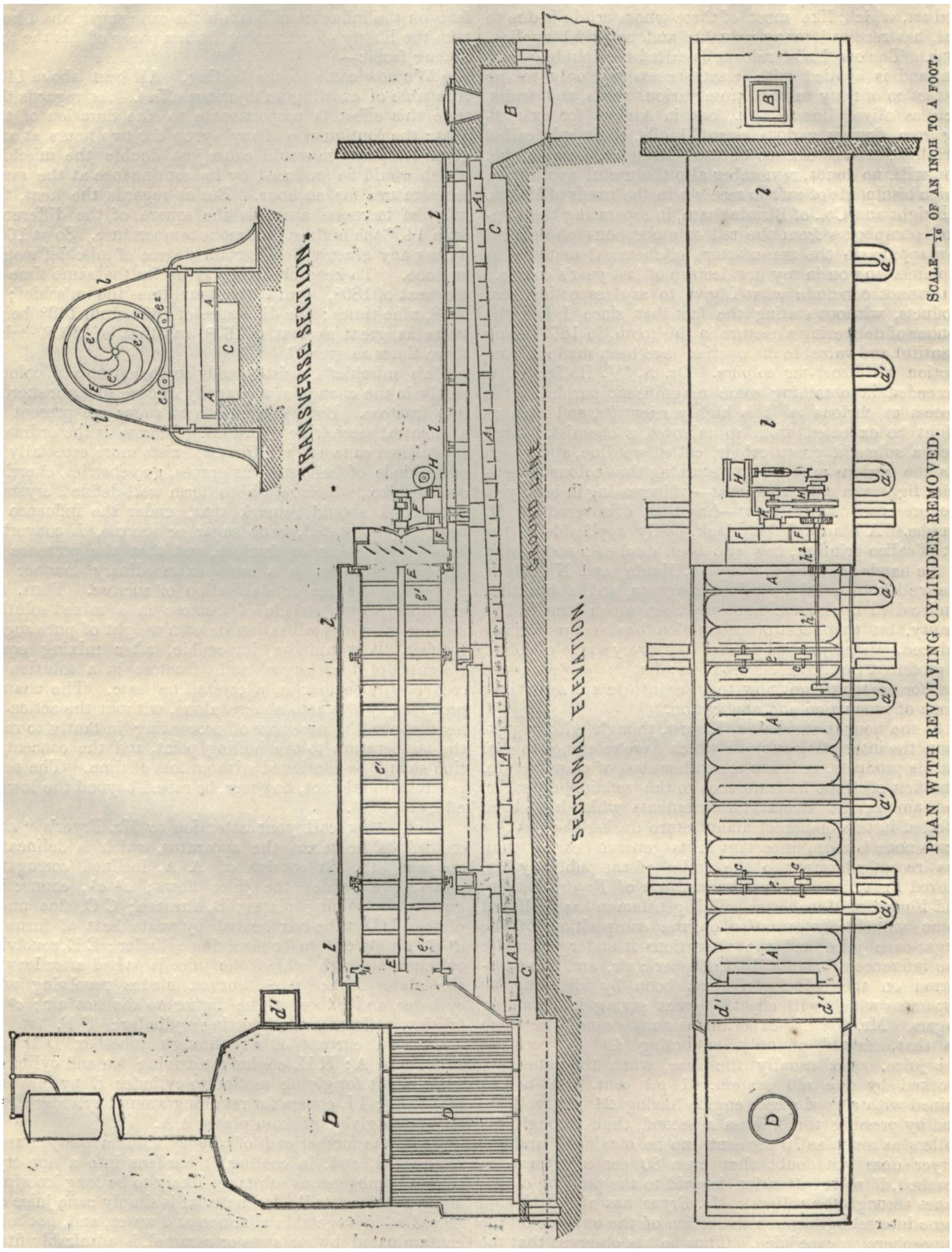
Mr. Fryer has also published some very interesting facts on the influence of heat on the cane sugar, and I here take the liberty of extracting from a paper of his the following facts :—

"We now come to the boiling. All heat above 140° is capable of exerting an injurious effect. As regards the time this effect is proportionate to the duration of the heat; the continuance of any syrup for two hours at any given temperature would cause just double the mischief which would be produced by its continuance at the same temperature for an hour. But as regards the heat, the mischief increases about as the square of the difference from 140° the highest innocuous temperature. So at 160° during any given time a certain degree of mischief would be done. To keep the same syrup for the same time at the heat of 180°, would give four times the mischief; at 200°, nine times; the difference of 180° from 140° being twice as great as that of 160°, and that of 200° being three times as great."

This mischief consists partly in the change of colour, partly in the change of a quantity of cane sugar or sucrose into fructose. Both these kinds of sugar are present in all neutral saccharine solutions. Sucrose is the ordinary crystallised cane sugar; fructose exists more especially in some kinds of fruit, such as grapes, gooseberries, cherries, oranges, &c., which refuse to form well-defined crystals. Further, I should remark that, under the influence of heat, as just stated, cane sugar or sucrose, is converted into grape sugar or fructose, and that the presence of fructose interferes in a most extraordinary manner by preventing the free crystallisation of sucrose. Thus, for example, every particle of fructose in a mixed solution detains from crystallisation its own weight of pure sugar. In fact, it would be impossible, after mixing equal weights of loaf sugar and fructose in a solution to recover the former in a crystalline state. The change produced by the atmosphere alone, without the action of heat, shows the necessity of proceeding instantly to raise the temperature to the boiling point, and the concentration should be continued without loss of time. The temperature should not, however, be raised beyond the lowest effectual heat.

I will now call your attention to Mr. Fryer's "concretor," as he terms the apparatus, which is delineated on page 718. It consists of A A, inclined corrugated plates, over which the juice flows; a^1 a^1, connecting gutters for joining plates; B, furnace; C C, flue under plates; D D, tube-box heated by waste heat of furnace; d^1 d^1, supply cistern for revolving cylinder; E E, revolving cylinder, through which the juice is passed after leaving the plates A A; e^1 e^1, curved blades revolving with cylinder, and exposing the liquor to the hot air; e^2 e^2, friction rollers for supporting cylinder; F F, fan for drawing a current of air through tube-box D D and cylinder A A; H H, engine for driving fan and cylinder; h^1 h^1, shaft for giving motion to cylinder E by means of pinion h^2; I I, covers for retaining around cylinder E the the steam given off from plates A A.

From the further end of the cylinder a pasty mass is discharged, and, in cooling, it hardens into a non-crystalline homogeneous substance likely to be long known as Fryer's "concrete." Its material is simply cane juice deprived of its vegetable albumen and water, and, not being contaminated by molasses or caramel, is admirably fitted for the operations of the refiner, and will, therefore, command his attention. Allow me, further, to add that his process is easy to conduct; the apparatus, as you see, is simple and self-acting, not liable to derangement; that it performs a large amount of work; and therefore proves a material saving to the sugar producer. I cannot conclude my remarks on Mr. Fryer's invention, as applicable to the colonies, better than by repeating here the words expressed by the Governor of Antigua, who said, "I believe firmly that you have opened a new era of prosperity to



This illustration is one of the first applications of a new process for producing surface blocks from a drawing. It has been produced for this Society as an experiment. The drawing was placed in the hands of the artist on Wednesday morning, and the metal blocks ready for the printer were delivered the following day. It is right to state that, the drawing being of a geometric character in outline, the difficulty of production is greatly increased. It should be added, that the drawing having been placed in the hands of a wood engraver of eminence on Tuesday morning last, it was returned by him as impossible to execute wood blocks in time for this week's *Journal*. The process and its bearing on Art production will form the subject of a Paper to be read at an early meeting of the Society.—Ed. *S. of A. J.*

our colonies, and heartily wish you abundant success in the course on which you have entered." As to the advantages which a sugar refiner in this country will derive from employing Mr. Fryer's "concrete," instead of having to refine the molasses and coarse sugars usually imported into this country, they are so obvious that it would be really a loss of time to enlarge upon them. The saving to the refiner in having nearly pure sugar to operate upon, and not having to contend with the removal of colour, converted sugar, caramel, and other impurities, will at once convince you of the support and approbation the article will receive from the sugar refiner.

If, at the commencement of this lecture, I drew your attention to the value of intense heat produced at a small cost so as to enable our manufacturers to carry on their various processes, it now becomes my duty to inform you that of late years the cheap production and application of low temperatures has become a necessity, especially since organic products have been manufactured on an extensive scale. Three different machines for obtaining these low temperatures have been brought to public notice, viz.: First. That of Mr. Kirk, who has applied in a beautiful manner some of the physical laws discovered by Dr. J. P. Joule and Professor W. Thomson, in their researches on the mechanical theory of heat. Thus, Mr. Kirk succeeds in producing a low temperature by condensing under high pressure atmospheric air, which, on being allowed to resume its primitive volume, produces cold, for the compressed air cannot resume its primitive volume without the essential element for its expansion, namely, heat; and if the apparatus is properly contrived, which is the case in that of Mr. Kirk's, the heat necessary for the expansion of the compressed air is supplied to it by the body whose temperature is to be lowered. Although the construction of this machine is exceedingly costly, still it has been employed at Mr. James Young's works at Bathgate with great success to the cooling of paraffin oil to extract from it the solid paraffin which it contains. The second apparatus is that of Messrs. Harrison and Co., of London, who employ ether as the medium for producing low temperatures. The third is that of M. Carré—in my opinion the cheapest and most practicable apparatus yet invented for the purpose, the more so that it is applicable for household as well as for manufacturing purposes. Although I, like many of you, have witnessed the production of ice by it at the late exhibition, still I was not prepared to learn that it could be applied with economy to the extraction of some of the salts existing in sea-water. Still such is the fact. M. Ballard, a well-known French chemist, after many years' study and labour, succeeded in extracting from sea-water two products, which play a most important part in most of our large chemical works, viz., sulphate of soda and chloride of potassium. To produce the first, under ordinary circumstances, extensive works are required, such as are found at St. Helen's, and Newcastle-upon-Tyne, where thousands of tons of common salt are acted on by vitriol, which gives rise to muriatic acid and sulphate of soda. As to the salts of potash, the French, as well as ourselves, are dependent for it upon the forests of Russia and the native forest of Canada. By M. Ballard's discovery, France will free itself from a dependence upon foreign supplies for the potashes she may require, as well as the sulphur, and will also do away with the public nuisance, namely, the conversion of common salt into sulphate of soda. Without entering here into details, let me state that M. Ballard operates as follows:—In the early part of the spring season, considerable quantities of sea water from the Mediteranean are run into large shallow reservoirs. In the summer season the water evaporates, a certain proportion of common salt, separates, and the concentrated water is stored in other reservoirs until winter, when it is again allowed to flow back into the shallow reservoirs, where it yields, during a cold night, thousands of tons of sulphate of soda. The mother liquors from which the sulphate of soda has separated are allowed to flow into Carré's apparatus, where they are subjected to a comparatively intense cold, and yield large quantities of a double chloride of magnesium and potassium, which, on being subjected to heat in a furnace, gives hydro-chloric acid, magnesia, and chloride of potassium. This application of Carré's apparatus, in this instance, shows the simplicity and practicability of it. It is based on rather a different principle to those of Kirk and Harrison. To obtain a low temperature he applies heat to a vessel which contains a saturated solution of ammoniacal gas. This drives off the gas, which is made to pass into a vessel surrounded with cold water, where it liquifies itself by its own pressure. If then the heat be removed from under the solution, its temperature will gradually fall, and it will become again susceptible of re-absorbing the ammoniacal gas, thus facilitating its evaporation from the vessel in which it has condensed, and as it is necessary for the passage of the liquified ammoniacal gas into its gaseous form that it should absorb the heat from the surrounding medium, let it be water or any other fluids, their temperature will gradually decrease. The following diagrams will enable you to understand better the working of this invention:—

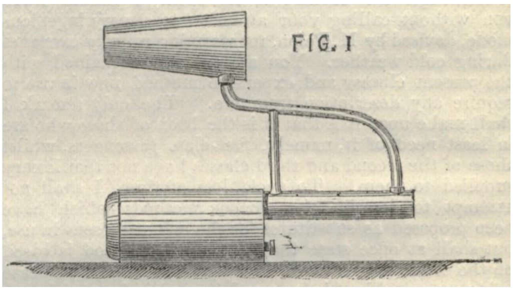


FIG. 1

1. Before each operation incline the apparatus horizontally, and maintain it about ten minutes in the position represented in Fig. 1. 2. Place the boiler (A) in the furnace, and the refrigerator (B) in a bucket filled with cold water, so that the summit of the refrigerator be covered with two or three inches of water. A small quantity of oil is poured into the tube which is placed in the upper part of the boiler, in which also a thermometer is placed. The apparatus is heated moderately until it reaches 266°. The apparatus is then removed from the fire, and the boiler is placed in the bucket of cold water. The hole of the refrigerator being stopped with a cork, and the tin vessel surrounded with alcohol, having previously nearly filled it with water, the congelation takes place by the evaporation of the liquid ammonia in the condenser.

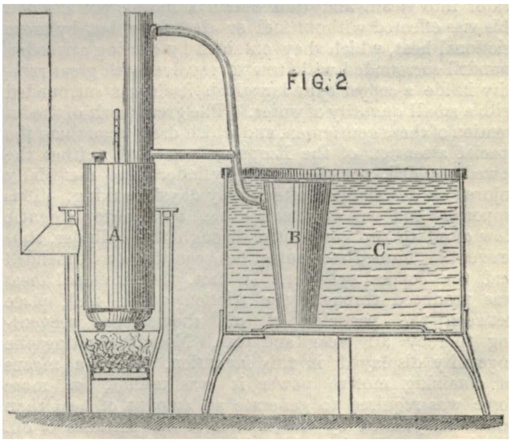
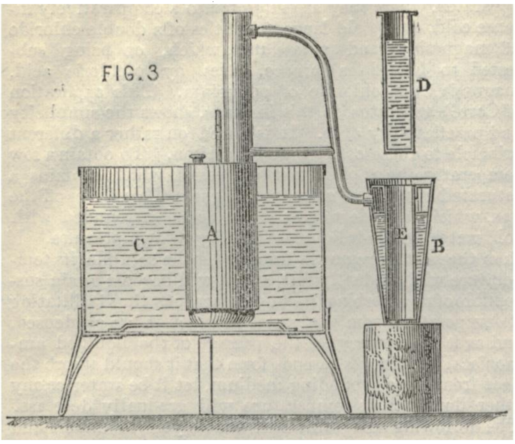


FIG. 2



Although the evening is far spent, I cannot leave you without calling your attention to a very ingenious mode, devised by M. Pelon, for warming railway carriages during cold weather. You are too well acquained with the present clumsy and expensive method now in use to require any description from me. The only remark I shall make upon it is that it is the boon of those who are in least need of it, namely, first-class passengers, whilst those of the second and third classes have not that luxury supplied to them. To avoid loss of time, I shall not attempt to describe the various methods which have been proposed as substitutes for the one at present in use, but shall at once state that M. Pelon's method is based on the conversion of force into heat, the heat in this case being generated by friction; and from what I stated in my first lecture you must be perfectly *au courant* of what is understood in the present day of the conversion of heat into force, and *vice versa.* All those persons who were fortunate enough to visit the French Exhibition in 1855 must have been struck with a machine, invented by Messrs. Mayer and Beaumont, which generated enough heat to convert water into steam and thus obtain a motive power; and this was effected without fuel or electricity, but by mere frictional heat, which they obtained by causing a wooden mandril surrounded with tow to revolve with great rapidity inside a copper cylinder which itself was surrounded with a small quantity of water. The great merit of the invention of these gentlemen, and which drew upon them the special attention of the Emperor, was that neither the towed mandril, nor the copper cylinder were materially injured or deteriorated after many days' working. This important end was attained by them by allowing a gentle flow of oil to run constantly through the cylinder, thus preventing immediate contact between the towed mandril and the copper cylinder. In fact, the frictional heat was produced through the friction which took place between the particles of oil themselves, preventing thereby all wear and tear. Notwithstanding the ingenuity displayed in this invention, still as a means of obtaining motive power it was useless, for more force was required to generate an amount of heat than could be yielded by the friction of the particles of oil. But in the application which M. Pelon has made of this invention to the heating of railway carriages, the motive power required to generate the heat being produced without cost to railway companies, as it is caused by the very act of the travelling of the carriages themselves, the cause which accounted for the failure of the principle as a practical mechanical application, namely, the production of the force required to work it, is overcome. M. Pelon proposes to fix one of Messrs. Mayer and Beaumont's mandrils under each railway carriage compartment, and to convey the heat produced by the revolution of the towed mandril to the compartment itself by means of metallic conducting surfaces, which in their turn will heat the atmosphere of the compartment. We shall, I am happy to say, within a year or two, know if M. Pelon's invention will be capable of general adaptation, as it is now being practically tested on one or two of the French railways.

Proceedings of Institutions.

Kent Association of Institutes.—The first annual meeting of the council was held at Ashford, on the 6th of July last, when H. Whitfeld, Esq., of Ashford, presided. It appears from the report that, immediately after the formation of the society, in July, 1864, the committee forwarded to every known Institute in the county, a prospectus, setting forth the objects and rules of the Association. They also issued a series of questions, with a view to the preparation of a table descriptive of the nature, position, and operations of Kentish Institutes. The replies placed the committee in possession of the following useful information:—That the Institutes in Kent number about seventy; of these twenty-five are termed Literary, or Literary and Scientific; ten, Mechanics' Institutes; seven, Mutual Improvement Societies; two, Soldiers' Institutes; six, Working Men's Clubs; ten, Young Men's Societies; six, Reading Societies; and four bear the less definite name of Institute. Most of these societies possess libraries, which contain in the aggregate about thirty-two thousand volumes, and are circulated amongst nine thousand members. Lectures are annually delivered at about fifty of the Institutes. Penny readings appear to have been successful at upwards of twenty. In-door amusements, such as chess and draughts, are provided by twenty; and out-door sports, as cricket, by seven. About thirty-five of the Institutes possess reading-rooms. In twelve classes have been formed for instruction in one or more of the following subjects:—Reading, arithmetic, writing, French, drawing, Latin, and music. Only six appear to have given attention to the schemes of examinations connected with the Society of Arts and other Educational Societies. The apparent wants of many of the Institutes may be classified thus:—1. Means of obtaining, at small cost, the services of suitable lecturers. 2. An acquaintance, on the part of the members, with the advantages derivable from the Society of Arts and other examinations. 3. Teachers qualified to conduct evening classes. 4. The formation or extension of libraries. 5. The possession of commodious premises. 6. That measure of public support which should be received specially from those classes for whose benefit the Institutes exists. To aid in supplying these wants (says the report) is the chief duty of this Association, and the committee have to point out how far they have been able to promote so important an object. A list of gentlemen willing to give lectures or readings to Institutes (on payment of travelling expenses) has been prepared and published. It contains at present only twelve names, but it will, in all probability, be considerably extended before the next winter season. The Society of Arts Elementary Examinations, also the Oxford Local Examinations, have been brought prominently before the notice of the inhabitants of Kent; and the Committee rejoice that their efforts in this direction have been crowned with no small measure of success. Through the liberality of gentlemen taking a great interest in the work of adult education, the committee are in a position to offer prizes, in books, to successful candidates at the examinations. Arrangements have been made for the establishment of a circulating library. For an annual subscription of two guineas, schools and Institutes will be entitled to fifty volumes at one time, which may be exchanged at the expiration of three months. Numerous applications have been made to the secretary for information as to the most suitable description of building for Institute purposes, and also as to the usual modes of raising funds for the erection of public buildings; and it is gratifying to know that some of the Associated Institutes are now in possession of very commodious premises, whilst others are making efforts to obtain adequate accommodation. The following schools and Institutes have been admitted into Union:—Ashford Mechanics' Institute, Chatham Mechanics' Institute, Chilham Mutual Improvement Society, Faversham Institute, Hamstreet Mutual Improvement Society, Rhode-street Schools (Chatham), LenhamMutual Improvement Society, Sheerness Literary Institute, Ramsgate Working Men's Club, Whitstable Institute, Sittingbourne Institute, Staplehurst Mutual Improvement Society, TunbridgeMechanics' Institute, Deptford Grammar and Collegiate School, Deal and Walmer Institute, Belgrave Mechanics' Institute (Tunbridge Wells), Ashford Mutual Improvement Society, and Lenham Grammar School. Returns made by eleven of the Institutes give as the total number of their members, 2,757; and of volumes in the libraries, 11,852. The Treasurer's statement gives the total receipts as £77 5s. 6d., and the expenditure as £50 18s. 6d., leaving a balance in favour of the Association of £26 7s.

CONSERVATOIRE IMPERIAL DE MUSIQUE ET DE DECLAMATION OF PARIS.

The following memoranda, having reference to the present state of the Conservatoire at Paris, and to the recent examinations held there, have been furnished by an occasional correspondent of the *Journal*:—

Officers of the Conservatoire.

Director—M. Auber, Member of the Institute of France; Secretary—M. Alfred de Beauchesne; Librarian—M. Hector Berlioz, M. of the Institute; Administrator—M. Lassabathie; Director of School—M. Duvernoy.

Professors, Assistants, and Teachers.

	Professors (Male).	Professors (Female).	Sub-Professors and Assistants (Male).	Sub-Professors and Assistants (Females).
Composition, counterpoint, and fugue	4	...	...	...
Written harmony	2	...	...	...
Thorough bass and practical accompaniment united	2	...	...	1
Vocal music	8	...	...	..
Sol-fa	4	...	4	6
„ collective	2	...	...	...
Vocal pieces	1	...	...	...
Lyric declamation	3	...	...	...
Theatrical comportment	1	...	...	...
Fencing	1	...	...	...
The study of parts	1	...	...	...
Reading aloud	1	...	...	...
Popular singing for adults	1	...	...	...
Dramatic declamation	3	...	1	...
Organ and improvisation	1	...	...	...
Piano	4	...	2	...
Instrumental pieces	4	...	...	...
Scales, "Clavier"	...	2	...	3
Harp	1	...	...	...
Violin	4	...	...	...
Violincello	2	...	...	...
Bass viol	1	...	...	...
Flute	1	...	...	...
Hautbois	1	...	...	...
Clarinet	1	...	...	...
Bassoon	1	..	...	...
Horn	1	...	...	...
Cornet-à-piston	1	...	...	...
Trumpet	1	...	...	...
Trombone	1	...	...	...
Military Class:—		...	...	...
Thorough bass and composition	2	...	...	...
Cornet	1	...	...	...
Saxophone	1	...	...	...
Saxhorn	1	...	...	...
Sol-fa	2	...	...	...
Total	66	2	7	10

In the list of professors are—M. O. Carafa, member of Institute; M. A. Thomas, ditto; M. Reber, ditto; M. Clapisson, ditto; M. Benoist, M. Henri Herz, M. Sax, M. A. Elwart, M. F. Bazin, M. Révial, M. Battaile, M. Giuliani, M. Masset, M. Fontana, M. Tariot, M. Duvernoy, M. Batiste, M. Pasdeloup, M. Levasseur, M. Morin, M. Mocker, M. Samson, M. Beauvallet, M. Regnier, Mdlle. Augustine Brohan, M. Georges Mathias, M. Prumier, M. Alard, M. Massard, M. Franchomme, M. Labro, M. Dorus, M. Cokken, M. Gallay, M. Meifred, and M. Arban.

Pupils.

The number of pupils is on the average six hundred, and there is no charge whatever for the general instruction of the Conservatoire in any of its classes. All are out-of-door pupils with the exception of twelve young men in the vocal school who are lodged, clothed (in uniform), and supported within the establishment. There is a box at each of the operas reserved for these young men. There were formerly as many female pupils lodged in the Conservatoire, but this was found so troublesome that pensions have been substituted in the place of residence. By way of compensation, a certain number of female pupils receive a pension of 800 francs a year for two years. All the in-door pupils and pensionaires are bound to appear, if required, at one or other of the operas or theatres receiving a subvention from the government; and no pupil in the schools is permitted to appear in public without the special authority of the direction.

Form of Application.

Each applicant for admission must apply personally, and produce certificates of birth and vaccination, must be French, and not less than nine nor more than twenty-two years of age. The applicants are examined by a professor, and if, according to his judgment, they are sufficiently advanced to complete their education in two years, or exhibit peculiar aptitude, they are admitted provisionally, and are again examined at the general meetings for that purpose, which occur in May and December. There is also an extra examination for the admission to the singing class in March. No set form of application.

Foreigners.

Foreigners may be admitted by authorization of the minister of state.

Provincial Schools.

There are five provincial schools—at Lille, Toulouse, Marseilles, Metz, and Nantes, which have the title of *succursales* of the Conservatoire, the last having been thus nominated in 1846. Some years since pupils were examined in these schools and sent up to the Paris Conservatoire, but this has been discontinued for some time, and candidates from the provinces have now to present themselves personally to the directors of the Conservatoire for admission. For all purposes connected with the pupils these local schools seem now to be completely dissevered from the Conservatoire—why, does not appear. That of Toulouse, however, exerts a very powerful influence, and supplies a large proportion of successful pupils. Not only is there no preliminary examination in the provinces, but there is no recommendation of pupils by any of the authorities or musical professors in the provinces.

Classes.

The education is divided into the following eight sections:—1. Solfa, scales and oral harmony. 2. Singing. 3. Lyrical declamation. 4. Piano and harp. 5. Stringed instruments. 6. Wind instruments. 7. Thorough bass, organ, and composition. 8. Dramatic declamation.

There are also courses of popular singing for adults, superior to those in the common schools.

The actual *classes* are, or were not long since:—

2 for Solfa, number of pupils unlimited.
12 for do. for individual practice, twelve pupils in each, limited to two years' duration.
1 for Oral harmony.
5 for Scales, 2 male, 3 female, limited to 8 pupils each.
8 for Singing, limited to 8 pupils each.
1 for do. *en masse.*
4 for Lyrical declamation.
5 for Piano, limited to 8 pupils each.
3 for Violin; 2 for Violoncello; and
1 for each of the other instruments.
1 for the performance of instrumental pieces.
6 for Harmony and accompaniment, 4 male, 2 female, limited to 12 each.
1 for Organ and Improvisation, 12.
4 for Composition, subdivided into counterpoint, fugue, and ideal composition.
3 for Dramatic declamation.
1 for Deportment }
1 for Dancing } For theatrical pupils.
1 for Fencing }

Library.

There is a fine library of music, and of works relating to music and the drama, and this is open not only to the pupils but also to the public.

Museum of Instruments.

There is a good collection of musical instruments attached to the Conservatoire, to which the public is admitted on certain days of the week.

Rooms.

The Conservatoire is a very large establishment, and includes a complete theatre, a smaller theatre or concert room, and innumerable class rooms of all sizes besides the library, offices, and apartments for the in-door pupils.

Competitions.

The annual competitions now take place in July, instead of August. They commenced this year (1865) on the tenth and ended on the twenty-ninth of the month, occupying twelve days in all. With the exception of the classes for the organ, harmony and accompaniment, fugue, thorough bass, scales and solfa, the competitions are conducted in public. They take place in the theatre of the Conservatoire, erected in 1806, and in which are given the famous concerts of the society formed within the Conservatoire, but not being officially a portion of it. This theatre holds more than 900 persons, but in a most inconvenient manner, but the excellence of the building for sound has hitherto set aside all idea of its reconstruction. It is arranged like an ordinary theatre, with three principal tiers of boxes, a balcony in front of the lower tier, *baignoires* around the pit, a gallery divided into boxes and stalls, a pit and pit stalls. The pit holds 150 persons, and there are 180 stalls. The form of the building is oblong, with circular ends, the stage and orchestra occupying more than half the whole area. The wall at the back of the stage is not in fact semi-circular but ten-sided. In the centre of the principal tier of boxes is the *loge-d'honneur*, which is the Imperial box for the concerts of the society, and for which the Emperor makes a donation of two thousand francs a year, and behind this is a good-sized antechamber.

Prizes.

During the competitions this box with the antechamber are devoted to the jury, who, after listening to the performances of the pupils in one section or class, retire and decide on the awards before another class commences; each pupil to whom any award is made is then called forward, and the decision of the jury announced to him. If the award has been unanimous that fact is announced also. The prizemen in the instrumental classes, with the exception of the great instruments, receive an instrument as their prize, others receive books of music, and the pupils of the elementary classes medals. Each successful pupil receives a written diploma in addition.

Jury.

The Jury generally consists of nine members, chosen according to the nature of the competition of the day—whether vocal, instrumental, or dramatic—from a body of thirty.

There are, however, five members who are present on almost all occasions, viz.:—M. Auber, Director; M. E. Monnais, Imperial Commissioner for the Lyric Theatres; M. Kastner, member of the Institute, composer; M. J. Cohen, composer; and General Mellinet, an eminent amateur and composer.

In addition to these gentlemen the following acted as members of the Jury during the competitions just concluded:—

M. Cabenis, Chef de Bureau of the Minister of Fine Arts (official); M. De Leuven, Director of the Opera Comique; M. Perrin, Director of the Grand Opera; and M. Hainl, Conductor of the Grand Opera—(Ex-officio members). MM. Ambrose Thomas (member of the Institute), F. Bazin, Benoist, Dauvernoy, E. Jonas, Clapisson (member of the Institute), Prumier, V. Masset, Pasdeloup, Elwart, and Cokken—Professors in the Conservatoire. MM. Wakerlin, composer; Rinaud de Vilbac, composer and pianist; Ravina, pianist; Wieniawski, pianist; Cuvillon, violinist; Léon Réquier (member of the Institute), Professor in the College of France; Colin, harpist; and Cremieux, composer.

As already stated, all the competitions are open to the public, with the exception of those amongst the pupils of the elementary classes; but in the case of opera, comic opera, and still more of tragedy and comedy, the demand for places is so great that the theatre is not half large enough to hold those who apply for seats and obtain them, as far as they go, by favour of the director. In the case of the vocal and instrumental competitions, the theatre is not half filled, and the military music attracts only the friends of the pupils themselves.

Competition of 1865.

Private (four days), prizes awarded:—

Fugue—2 first and 1 second, males.

Harmony and Accompaniment—1 first prize, divided between two young men; two first prizes to females.

Harmony alone—1 first prize between two males.

Scales—36 competitors, male and female; 7 third prizes to female pupils.

Sol-fa—125 competitors; prizes, 8 first medals, 9 second medals, and 8 third medals to male pupils; 11 first medals (one gained by a child nine years old), 14 second medals, and 6 third medals to female pupils.

Public:—

Singing—(male classes) 20 competitors and 11 awards, viz., 1 first and 3 second prizes; "accessits," or honourable mentions, 3 first, 2 second, and 2 third; (female classes) 30 competitors and 17 awards, viz., 4 first and 3 second prizes; and 2 first accessits, 3 second, and 3 third.

Pieces—air, 2nd act "La Dame Blanche;" air, 4th act "Lucie;" air, "La Juive Moïse;" rondo, "Cenerentola;" air, "Macbeth;" air, "Traviata;" air, "Norma;" air (Joseph), "Vaniceunt Pharaon;" air, (Mousquetaires) "Bocage épais;" air, "Fille du Regiment;" and air, "Pré aux Clercs."

Violin—Piece selected, 8th Concerto of Rode, 23 competitors, male and female. Prizes, 3 first (1 female) and 1 second; 1 first, 1 second, and 1 third accessit.

Violoncello—8th Concerto de Romberg; 1 first prize, 2 second prize, and 1 accessit.

Opera Comique—This is the most popular portion of the competition, and also that in which the pupils are generally strongest. It was especially so this year. There were 22 competitors, male and female, and 17 awards, viz., male pupils, 1 first, 2 second prizes, 2 first, 3 second accessits; female pupils, 3 first prizes, 2 second prizes, and 2 first and 2 second accessits.

Acts and Scenes, performed as well as sung, in stage costume:—Scene from "Le Tableau Parlant;" fragment of 1st act of "La Fiancée;" scene from "Les Dragons de Villars; fragment from "Les Dragons de Villars;" finale of "Noces de Jeannette;" scene from "Noces de Jeannette;" scene, 3rd act, "Mousquetaires;" finale, 1st act, "Galathée;" operetta, "Le Chalet;" operetta, "Le Maître de Chapelle;" scene, "Barbier;" scene, 1st act, "Songe d'un Nuit d'Eté;" and scene, "Toréador."

Piano—11 male and 35 female competitors. (This class is generally pronounced to have been weak.) Male pupils, 1 first, 2 second prizes; 2 first, 1 second, 2 third accessits. Female pupils, 3 first, 3 second prizes; 3 first, 3 second, 4 third accessits. Piece played by male pupils, "Concert Stück" (Weber); pieces played by female pupils, "Concerto in B minor" (Hummel).

Harp—4 competitor. 1 first accessit only awarded.

Opera—18 Competitors; awards, male pupils, 1 first prize (divided between 2 pupils), 2 second prizes; 3 first 2 second accessits; female pupils, 1 first prize (divided between 2 pupils), 1 second prize, 1 first, 1 second accessit. Acts and scenes given:—Last scene "Romeo et Juliette;" scene, "Robert le Diable."

Wind Instruments—Flute, 1 first, 1 second prize; 2 first, 1 second, 1 third accessit. Horn, 1 second prize; 1 first accessit. Clarionet, 1 first, 2 second prizes; 1 first, 1 second accessit. Bassoon, 1 first, 1 second prize. Hautbois, 1 first, 2 second prizes; 2 first, 2 second, 1 third accessit. Sarcophone, 1 first prize, 1 first prize divided in 2, 1 second prize, 1 second prize divided in 2; 3 first, 3 second, 3 third accessits. Saxhorn, 2 first, 1 second prize; 3 first accessits. Trumpet, 2 second prizes; 2 first, 1 second, 1 third accessit. Trombone, with slides, 1 first prize. Trombone-à-piston, 1 first prize; 1 first accessit. Cornet-à-piston, 2 first, 3 second prizes; 1 first accessit. The instrumental classes bear a high reputatien.

Total Awards.

The total of the above awards is:—

	1st Prizes.	2nd Prizes.	3rd Prizes.	Accessits.
Harmony, &c....	6	1	0	0
Vocal music	11	13	0	31
Instrumental	19	24	7	50
Total.........	36	38	7	81

in addition to the medals given to the pupils in Sol-fa, 56 in number.

Two of the prize-holders were immediately engaged by the director of the opera, and are announced to appear in "Marie."

Distribution of Prizes.

The public distribution of the prizes took place on the 4th of August, under the presidency of Marshal Vaillant, the Minister of the Beaux Arts, supported by the First Chamberlain of the Emperor and Superintendent of the Theatres, Count Baciocchi; M. Camille Doucet, Director of the Theatres; M. Auber and all the principal professors; and the managers of the Imperial theatres.

The principal point in the President's Speech was that which referred to the fact of an augmentation in the grant to the Conservatoire having been made during the last session of the Corps Legislatif, to the extent of £836, with the view of increasing the salaries of the professors.

The meeting concluded with the performance, by the pupils, of—A fantasia on the violin; an air from "Macbeth;" an air from "La Dame Blanche;" selections from "Le Barbier de Seville;" and selections from "Roméo et Juliette."

MISCELLANEOUS.

Common Schools.

A competition took place a short time since between the schools (communal) of the left bank of the City of Paris, in Harmony, Reading at Sight, Sol-fa, and Dictation. The Jury included—M. Victor Foncher, President of the Imperial Commission for Singing; M. Ambrose Thomas, General Mellinet, Edouard Rodrigues, Bazin, and others. There were distributed to certain schools—For adults, 3 first prizes and 2 second prizes. For boys, 3 first prizes and 1 second prize (divided). For girls, 1 first prize and 1 second prize.

Schools for Religious Music.

The competition amongst the pupils of the School for Religious Music took place on the 28th of July, under the presidency of M. Victor Hamille, Director of the Administration des Cultes, and M. Lefèvre Niedermeyer, the Director of the school. The following is the list of awards:—

Musical composition, counterpoint and fugue, harmony, organ (two divisions), *plain chant*, piano (two divisions)—2 prizes in each, first and second class; sol-fa—1 prize.

It is remarkable that of all the laureates only one was of Paris, the others were from Pamiers, Arras, Dijon, Montpellier and Cambrai.

International Competition at Cambrai.

The international competition took place at Cambrai, on the 20th of August last. Four thousand artists sent in their names for the competition. MM. Ambrose Thomas, Gounod, Bazin, Elwart, Gevaert, Laurent de Rille, Sernaet, and other well-known composers and professors, formed part of the Jury. The prizes were twelve "medals," of 300 francs each.

Payment of the Opera Band.

The members of the orchestra of the Grand Opera have lately petitioned for an increase of salary, which has not been accorded. It appears that ten only of the performers receive 2,500 francs (£100) each a year; eight, from 2,000 francs to 2,200 francs each; twenty-nine, from 1,300 francs to 1,800 francs each; thirty-four, 1,200 francs each; one, 1,100 francs; one, 950 francs; and one, 750 francs. The petitioners asked for a slight rise in the higher salaries, and that each artist playing instruments, in the case of which a competitive examination is enforced, shall have at least 1,800 francs per annum. Amongst the solo players at the opera at the present moment are:—Flute, M. Dorus; Horn, M. Mohr; Cornet-à-piston, M. Forestier; Trombone, M. Dieppo (Professors at the Conservatoire); and MM. Altès, Cras, Berthélemy, Leroy, Rose, Maury, Lendet, and Garcia. The whole of these gentlemen are members of the Society of Concerts in the Conservatoire, and of the Imperial Chapel band.

The performances at the Opera occur three times a week besides Sundays.

Commerce.

THE SUGAR TRADE.—The news of the French beetroot crop (say Messrs. Travers) continues to be favourable. The weather is beautiful, and, from the drought, little else can be done in the fields, so that the roots are being rapidly taken up and sent to the factories. Growers wish to profit by the unusually good condition of the root, and the facilities for transport given by the long days and fine weather. "Caution should be used, however," says the *Journal des Fabricants de Sucre*, "by the makers in taking in supplies, for it is doubtful whether the root will keep long in weather like the present—a burning sun, and nights not yet cooled by the autumn frosts. As to the result of the manufacture, it is as yet too early to give an opinion, but, notwithstanding some complaints of a want of density in the juice, there is ground for believing that a better yield than last year's will be obtained. The season 1865-6 thus commences under favourable circumstances, and bids fair to be highly remunerative to the growers, the makers, and to France at large. The news from Germany is also improving. The misfortunes of the summer have been to a considerable extent impaired by the late superb weather, and even the field injured by the grey worm look far better than could have been expected some time since. An average harvest of the root is looked for in Germany. The reports as to the saccharine richness of the juice differ greatly, but there is as yet little authentic information to be had, as most of the makers have put off commencing work for some weeks later than usual, in order to let the root benefit as much as possible by the favourable weather. In Silesia, however, it is ascertained that the juice is very rich and easy to work. Fourteen and even 14·5 per cent. of sugar is shown by the polariscope to exist in the juice, in by no means rare cases." While the prospect of the crop is thus generally favourable, its abundance has created alarm in the French market, where a perfect glut of sugar appears to be anticipated. The rise in the price of cane sugar in England, while in France the advance has been to nothing like the same extent, has called the attention of English buyers to the French market; and large purchases have been made of cane and beetroot sugar for our ports. This new outlet has given more confidence to the French makers, and has enabled many of them to make remunerative contracts. The purchases of refining kinds of beetroot sugar for Great Britain have been large, but we believe that the orders have principally come from the Clyde. We hope, however, at a not distant date, to see crystallised beetroot sugar, suited for direct consumption, regularly offered in this market. Pieces have already been sold for forward delivery in this market. White crystallised sugar is now quoted at 35fr. the 50 kilos. in Paris, or about 43s. 6d. here; and even if there is not sufficient margin between prices in the two countries at present, we shall probably before long see fine French sugar, defying the higher duty and competing with our refiners' goods in moist as well as stoved kinds. It is certainly a remarkable fact that the foreign refiners, in spite of the charge for freight, the 12s. 10d. duty, and the equitable drawbacks supposed to be established by the Convention, should be enabled to beat our refiners in their own markets. We Englishmen, in our national pride, are too apt to pre-suppose that we can beat all foreigners in machinery and its applications to our own particular province. But this over-confidence in our own merit has lately had some severe shocks, in the inability of English to compete with foreign machinists in supplying locomotive engines and other machines. Presumptuous persons have even ventured to hint that we are far inferior to the French, and even to the Scotch, in everything connected with sugar-making; but the chilling reception given to their insinuations has discouraged a repetition of the attempt to shake the confidence of Londoners in the skill of their countrymen. The foreigners certainly use a far better class of sugar for refining, and it would be worth while to find out why they do so. Is it because the continental consumption of brown sugar is limited, and that in consequence of this fact the refiners buy a strong and fine sugar in order to leave as little pieces as possible? If this explanation be correct, it is evident that the reason of the foreigners making cheaper sugar is found; for in order to enable the pieces and bastards left after extracting the loaves to compete with raw sugar, the London refiners have been obliged to sell the lower products at little or no profit, and to get their profit from the stoved sugar. The English public use brown sugar in very large quantities, and there is thus some apparent justification for the practice of buying comparatively low qualities at a cheap rate, with the view of supplying the consumption of brown as well as of white sugar; and the system, though wrong in theory, answered very well while an extra protection duty was levied on foreign refined. Since the imposition of the 12s. 10d. in place of the 18s. 4d. rate, the practice has to some extent been abandoned by our refiners, to enable them to keep the Dutch and French goods out of the market, but we might surely with profit use a stronger sugar for refining. Some light has recently been thrown on the kinds most suited to the refiner by the examinations carried on with polarized light by M. Emile Monier, into the constitution of sugar, and published in his work, "Guide pour l'Essai et l'Analyse des Sucres." (Paris: E. Lacroix.) This book contains a perfect mine of information for refiners, and it would seem that the polariscope, or optical saccharometer, by which the results given are arrived at, is not nearly so well known among us as it ought to be. By the use of this delicate instrument the saccharine richness of sugar can be shown to the minutest fraction, and the system of classification by shades of colour, or of types, is shown to be entirely delusive. A yellow sugar, of which the crystals are clear and good, is often richer than a white sugar of which the crystals are hardly formed, or badly defined. The richness also varies in samples of sugar of the same shade of colour. Thus, No. 12 of French beetroot sugar contains from 92 to 97 per cent. of crystallizable sugar—a difference of 4 per cent. in richness and a margin of 4 francs in the buying price. At the same time this sugar (No. 12), when good, contains 97 per cent., or the same saccharine richness as some samples of Nos. 18 and 19, worth 4s. or 5s. per cwt. more in the market. We propose to return to the light thrown by M. Monier's figures on the sugar duties in a future article, and at present to notice his conclusions on the relative richness of sugar. M. Monier states that beetroot sugar, as presented in the market, is richer than any other kind of saccharine matter, and gives the greatest yield when refined. The principal distinction between cane and beetroot sugar is, that the former contains 10 to 15 times as much glucose or incrystallizable sugar. Independent testimony to the superiority of the beetroot to the cane sugar is given by Mr. Barron, in his report upon the Belgian Sugar Industry ("Reports of the Secretaries of Legation," No. 6, page 208:—"Beetroot sugar is preferred by the refiners for the volume and whiteness of its yield. In refining it gives a much larger yield in loaves than Havana or Jamaica sugar." After the beetroot, M. Monier places the sugars of Java, Cuba, Mauritius, and Bourbon; and last, those of Martinique, Gaudaloupe, and Porto Rico. We should be curious to know where M. Monier would place the lower classes of British West India sugars, on which he has apparently made no experiments. We fear they would end his list. These analyses throw considerable light on the question of why the foreign refiner can produce loaf sugar more cheaply than the English—it is by the use of beetroot, Java, Cuba, and Mauritius sugars—instead of inferior kinds. The interest taken by the trade in the imports of beetroot will be added to, as the refiner makes more loaf sugar from it. With some approach to free trade in sugar, English refiners must be ready to make changes in their manufacture, or they will continue to lose ground. In the revenue returns for the year 1864-5, a charge appears for native British sugar, and this item has led to some speculation, on the part of those interested in the subject, as to whether beetroot had again been tried in England. That starch sugar was made in this city was certainly not generally known, as it was thought that the manufacture was prohibited by the excise. The following extract from the *Times*, however, shows that a general misapprehension existed on the subject:—"British-made sugar has long held a merely nominal place in our list of exciseable articles, but in the past year two manufactories of glucose, or starch sugar, have been established in London. The quantity brought to charge in the financial year 1864-65 was 1,064 cwts. The materials from which this sugar is made are chiefly sago and potato starch. It has but little resemblance to cane sugar, and less sweetness than the lowest class of colonial sugars The rate of duty with which it has been charged is 9s. 4d. per cwt., being that on yellow Muscovado, or brown clayed sugar. It is stated that it is intended to be used in brewing. The imposition of the 9s. 4d. rate on sugar possessing so little saccharine matter gives a new instance of the injustice of the scale of duties.

Colonies.

WHEAT IN SOUTH AUSTRALIA.—The acreage of the wheat crop last year amounted to 390,836 acres, or two-thirds of the total cultivated land. In 1863-4 there were 335,758 acres under wheat, or 60 per cent. of the tilled land; the increase this season, therefore, amounts to 6 per cent. The total produce of the harvest was 4,252,949 bushels, compared with 4,691,919 bushels in the yield of the previous harvest, showing a decrease of 438,970 bushels, the average yield per acre being only 11 bushels as against 14 bushels last, and one bushel less than the average of the last seven years. There is no doubt but that the low average of the South Australian wheat crop is owing to the imperfect cultivation of a great portion of the land; many small holders are compelled to plough and sow the same ground year after year, without any intermission or attempt to replenish the soil by fallowing or other means, resulting in a very low return, and thus reducing the average result of the whole colony, which is invariably exceeded by the better class of farmers, whose more extensive holdings enable them to pursue a systematic plan of operations, in which more careful tillage, rest for the soil, and a combination with stock farming are stated to be essential to, and generally productive of, success. Seven-eighths of the wheat crop was reaped by machine, being less than last year, notwithstanding the increased cultivation. The most important advantage our farmers possess over those of the sister colonies is the expedition and economy with which their crops can be gathered, owing to the successful method of the reaping machines now universally used on all but hilly ground, permitting of the grain being reaped, winnowed, cleaned and bagged on the harvest-field, and removed into the store ere the day is closed. The high prices ruling for wheat have caused the farmers to look more particularly to their grain crop for profit, and had the effect of reducing the breadth laid down for hay by 9,020 acres, the total area sown being only 66,570, compared with 75,590 acres the previous year; and, as the average yield was 4 cwt. less—say 23 cwt. instead of 27 cwt. per acre, the deficiency in the crop is very large, no less than 25,637 tons; the total quantity grown being 76,656 tons, against 102,293 tons in 1863-4, showing a falling off of one-fourth.

EDUCATION IN SOUTH AUSTRALIA.—The Report of the South Australian Board of Education for the year 1864 has been published in the Colonial Government *Gazette.* It shows that during the year there was an increase of 20 schools and 1,190 scholars on the previous year. The average number of schools for the year was 258, and the number of scholars on the rolls, 11,511, being an increase of 817 scholars on the previous year. The following table exhibits the number of scholars at their most favourable season, with their increase or decrease on the previous year, the number of licensed teachers being equal to the number of schools:—

	Boys.	Girls.	Total.
Adelaide	939 ...	624 ...	1,503
Corporate Towns ...	631 ...	303 ...	994
Country	5,476 ...	4,926 ...	10,402
	7,046	5,913	12,959

The amount expended by the Board in stipends to teachers was £12,914, or on an average £48 7s. 4d. for each teacher, and an average of 19s. 11d. for each scholar, against £1 3s. for the year previous. The aggregate amount of school fees received by teachers from parents, &c., of 11,954 scholars, not including 1,005 destitute, for which the fees are paid by the Board, nor for evening scholars, was £12,555 10s. The entire cost of education at the public schools, exclusive of all expenses, is shown to be £26,476 3s., or an average of £2 0s. 10d. for each scholar, against £2 1s. for 1863. This also gives the entire average receipt of each of the 258 teachers, the average number for the year £102 12s. 4¾d. against £101 7s. 7d. for 1863.

Notes.

PARIS EXHIBITION OF 1867.—The Imperial Commission has confirmed, by public notification, the report concerning the plan to be adopted with respect to the motive power to be employed at the Exhibition. Instead of concentrating the generators and motive engines on one spot, as in the case of former Exhibitions, the Imperial Commission deems it preferable to distribute them in several distinct buildings around the palace, in order to give increased facilities, and at the same time more security against accidents or interruption in the service. It has decided also that the power shall be supplied, not by the Commission, but by private engineers and contractors, who will be invited, on certain conditions, to set up one or more groups of generators, with all the necessary means of transmitting power to the machinery to be driven. The contractors for this service will, as far as possible, be taken from the body of French and foreign exhibitors, and the boilers and driving machinery will form an integral portion of the Exhibition. The duty undertaken by each exhibitor of motive machinery is to be explicitly noted in the catalogue. The power may be obtained by steam or any other means offering sufficient guarantees. Of course, the exact details of the work to be undertaken cannot be given until the arrangements are more advanced, but those who desire to tender for the supply of motive power may consult a statement of the general conditions laid down by the Commission for such service, and now lying for reference at the offices of the Commission at the Palais de l'Industrie, in the Champs Elysées.

EXHIBITION OF FISHING APPLIANCES.—The Prefect of the Pas de Calais has established an international exhibition of fish and fishing appliances at Boulogne-sur-Mer, under the patronage of the Marquis de Chasseloup-Laubat, Minister of Marine. The object of the Prefect is to give the fishermen in his department an opportunity of learning the manner in which fish are caught in other countries, both in salt and fresh water. It may be interesting to state that the Society of Arts, nearly one hundred years since, opened an exhibition of a similar character at its house in London, for the purpose of instructing English fishermen in the methods employed by the Dutch in the turbot fishery, which was at that time wholly in their hands. And further, the Society offered the sum of £500, to be awarded as prizes of £5 and £3 for each hundred of fish of given size, caught and brought to shore by English vessels. In order further to facilitate the learning of the art, each vessel was allowed to have one foreigner on board.

ASYLUM FOR THE MIDDLE CLASSES.—There exists in Paris and in other parts of France many excellent establishments for the relief of persons of small income, some of which take the form of hospitals and lunatic asylums, (maisons de santé), while others serve as retreats for the aged. One of the latter class has just been opened at Auteuil, near the Bois de Boulogne; it was established by the Administration of Public Assistance, with funds given by a gentleman and lady named Chardon-Lagache. The new asylum receives married couples, as well as single persons, and the expenses are defrayed half by the inmates themselves or their friends, and half from the funds of the foundation. The establishment is arranged to accommodate two hundred persons, and it is already half full. The cost of the building—defrayed entirely by Monsieur and Madame Chardon-Lagache—was upwards of £60,000, and the ground upon which it stands—given by the Administration—is valued at about one-third of the above sum. The new asylum was formally inaugurated last week, in the presence of the founders and of the officers of the Administration, and the chapel appertaining to it was consecrated by the Abbé Surat, Archdeacon of Notre Dame.

Names of Streets in Paris.—An old street, with a long antiquated name, *Rue des Ecuries d'Artois*, so called from the fact of the stables of the Count d'Artois having originally occupied the site, is to be re-christened after the poet and romancist, Alfred de Vigny, who resided there for forty years in the same house. Few literary men have left a brighter or purer name than Alfred de Vigny. Many streets and boulevards in Paris are named after literary and scientific celebrities, French and foreign. Arago, Balzac, Byron, Béranger, Boileau, Beaumarchais, Bossuet, Buffon, Chérubini, Crébillon, Chateaubriand, Cuvier, Dalembert, Descartes, Dupuytren, Fénelon, Fontain, Fontenelle, Franklin, Fulton, Geoffroy St. Hilaire, La Harpe, Jacquard, Rousseau, Jean Gougon, Jussieu, La Bruyére, La Fontaine, Lavoisier, Richard Lenoir, Lulli, Masillon, Molière, Montesquieu, Montgolfier, Newton, Pascal, Rabelais, Racine, Réaumur, Regnier, Rossini, Say, Sedaine, Thénard, Watt, Volta, Voltaire, and many more. It is a popular and most economical mode of keeping the names of great men in the mind of the people.

International Postal Arrangements.—The French government loses no opportunity of improving its postal arrangements with foreign countries. Three decrees have just been published respecting conventions made between Switzerland, Prussia, and France. On and after the 1st of October, in the present year, the postage of a single letter weighing ten grammes, the third of an English ounce, passing between any part of France or Algeria and Switzerland, will be reduced to thirty centimes; at present the charge is equal to four pence per quarter ounce. At the same time, post-office orders will be exchangeable between the two countries, as they already are between France and Italy. The still more recent convention between France and Prussia will make no alteration in the postage of letters as regards Prussia proper, but will allow of the transmission of commercial and business papers at the rate of fifty centimes per two hundred grammes, or about five pence for rather more than six ounces and a half; it also establishes the exchange of money orders, not only between France and Prussia, but also between the former and the other States of Germany served directly by the Prussian post. No order is to exceed two hundred francs in amount, and the tare is fixed at twenty centimes for every ten francs. The establishment of the system of post-office orders between these four countries—France, Italy, Prussia, and Switzerland, affirms the principal of small payments by the means of the post, and there is little doubt that before long it will be extended over of the whole of Europe.

Patents.

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From Commissioners of Patents Journal, October 6th.

Grants of Provisional Protection.

Bacon-curing rooms, cooling—2338—R. A. Boyd.
Blast furnaces—2413—R. A. Brooman.
Boots and shoes—2339—J. Dunbar.
Boots and shoes, water-proof soles for—2449—J. W. Coburn.
"Bourdon's" steam pressure guage, improvements on—1509—T. E. Wright.
Box-irons—2358—J. Whitehouse.
Bricks and tiles—2398—W. Porter.
Brooms and brushes—2386—G. Smith and C. Ritchie.
Carpets, &c., materials for—1775—J. and A. Longbottom.
Cartridges—2475—J. Broun.
Coke and charcoal ovens—2477—W. Morgans.
Cricket and other balls—2328—C. Huntley.
Docks and canals, caissons for closing—2364—H. Law.
Earth, machinery for excavating—2403—J. B. Hulme.
Elastic material, adaptation of—2423—M. Cartwright.
Fabrics, dyeing and printing—2327—J. Lightfoot.
Fire-arms and ordnance, rifling for—2354—W. B. E. Ellis.
Flags and stones, dressing—2411—B. Chaffer, and J. & C. Thompson.
Flues—2467—J. Hilliar.
Gas, generating illuminating—2435—J. H. Johnson.
Gas, generating illuminating—2439—A. V. Newton.
Gas, method of lighting—2308—A. Mackie and J. Paterson.
Grain, winnowing—2300—W. L. Wise.
Horse-shoes—2433—G. Davies.
Hydrostatic presses—2304—J. and W. Weems.
Invoices of goods conveyed by rail, securing—2407—E. W. Collier.
Lace—2312—W. E. Newton.
Locks—2360—R. A. Brooman.
Lubricating apparatus—2352—I. Beamish.
Noxious gases, deodorizing—2451—E. Brooke.
Oils and greases, insoluble—3390—I. S. McDougall.
Paddle wheel—2481—J. J. McComb.
Paper and envelopes, bordering—2441—J. Parkins.
Peat for fuel, preparing—2469—G. T. Bousfield.
Preserving food, &c., vessels for—2473—L. H. Gillet.
Railway plant to ensure the safety of passengers—2463—C. M. Kernot and N. Symons.
Reaping and mowing machines—2310—J. Brigham and R. Bickerton.
Reaping machines—2324—C. T. Burgess.
Safes—2318—A. E. Nordenskiold and J. W. Smith.
Safes—2457—C. Parigot and A. Grivel.
Sewing machines—2169—D. Macpherson.
Ships and boats, propellers for—2258—R. Davies.
Ships, cleansing and coating the bottoms of—2316—R. P. Roberts.
Smoke, consumption of—2405—W. Watkin.
Smoking pipes and cigar holders—2362—S. Myers.
Soda waste, obtaining sulphur from—2443—M. Schaffner.
Spinning and doubling, mules for—2342—J. Dodd.
Steam boilers, cleaning the tubes of—2346—S. Soutar.
Steam boilers, preventing incrustation of—2321—W. and S. Tyne and R. Clayton.
Steam engines—2479—J. R. Arnoldi.
Steam engines, condensing the steam of—2376—F. Daina.
Stirrup latch bar—2320—S. Davis.
Submarine telegraph cables—2326—S. Inkpen.
Sugar—2385—J. Fletcher.
Sugar decolorising vessels, supplying charcoal to—2292—J. Dawson.
Sugar, &c., decolouring—2409—W. Clark.
Swivels—2334—J. Welch.
Telegraphic conductors—2332—J. Macintosh.
Tiles, ornamentation of—2378—H. Venables.
Vessels, unloading—2302—W. Cory and J. H. Adams.
Washing machines and churns—2471—J. Taylor.
Water, purifying—2415—A. Bird.
White lead—2427—P. Spence.

Inventions with Complete Specifications Filed.

Fire-arms, rifling—2488—W. E. Metford.
Telegraph cables—2509—J. A. Mee.

Patents Sealed.

1050. W. Weatherley.
1011. A. G. Hunter.
1012. S. Moore.
1013. T. Turton.
1018. R. A. Brooman.
1020. W. Brooks.
1025. W. Clark.
1026. D. Payne.
1044. G. A. Montenat.
1070. M. Smith.

From Commissioners of Patents Journal, October 10th.

Patents Sealed.

910. H. A. Bonneville.
1042. H. Sikes.
1045. J. M. Hart.
1046. T. J. Mayall.
1047. F. Bapty and E. B. Sayers.
1061. C. Turner.
1063. T. Bennett.
1065. J. McDowall.
1075. E. and G. H. Morgan.
1077. A. W. Hale.
1085. J. Gardner, R. Lee, G. H. Wain, S. Hargrove, and C. and S. Hargrove.
1109. F. Wise.
1111. D. S. Buchanan.
1125. E. Lord.
1175. J. W. Lowther.
1223. J. H. Johnson.
1679. J. Gale.

Patents on which the Stamp Duty of £50 has been Paid.

2671. R. Broadbent.
2700. S. F. Cox.
2818. J. Tangye.
2710. H. D. P. Cunningham.
2726. J. H. Johnson.
2784. J. B. G. M. F. Piret.

Patents on which the Stamp Duty of £100 has been paid.

2207. A. Bessemer.
2212. G. Hamilton & W. H. Nash.
2230. D. Naylor.
2387. B. Goodfellow.
2787. J. Jobson.